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**GB 2074062 A EP 0452593 A US 5313746 A**

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## (54) Abrading assembly

(57) An abrading assembly comprising a self-supporting, resiliently flexible support layer (12) in the shape of a polygon having  $n$  sides and  $n$  vertices where  $n$  is an integer which is 3 or greater than 4, said support layer having a front surface and a rear surface, and  $n$  peripheral edge surfaces (18) between said front and rear surfaces;

a flexible abrasive sheet (20) in contact with the front surface of the support layer, said sheet being square or rectangular in shape and having dimensions such that the vertices of the support layer lie on the perimeter of the sheet, and at least two of the corners (24) of said sheet being folded such that the folded corner portions (24) of the sheet are in contact with at least two of the peripheral edge surfaces of the support layer; and means (25) for securing the folded corner portions (24) to the support layer.

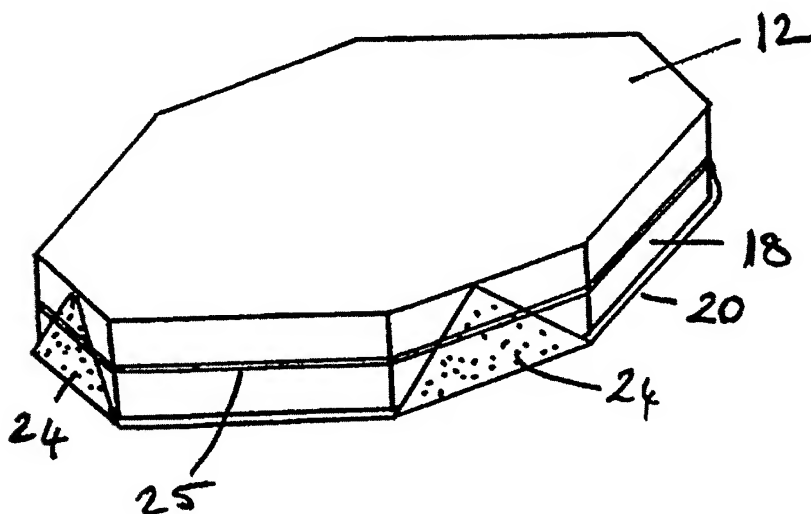


Figure 2

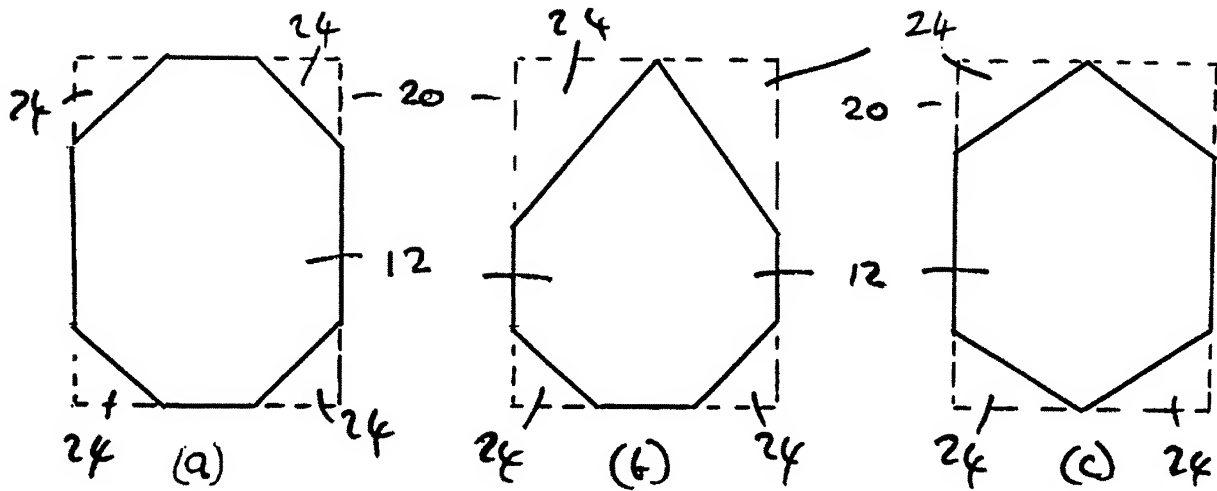


Figure 1

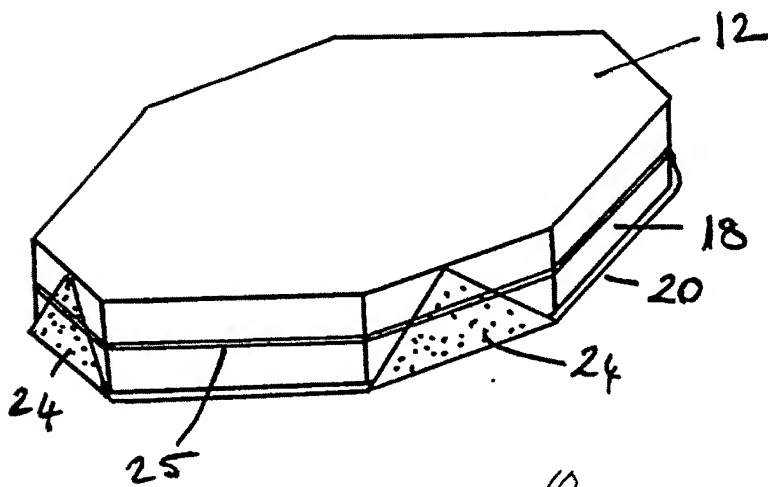
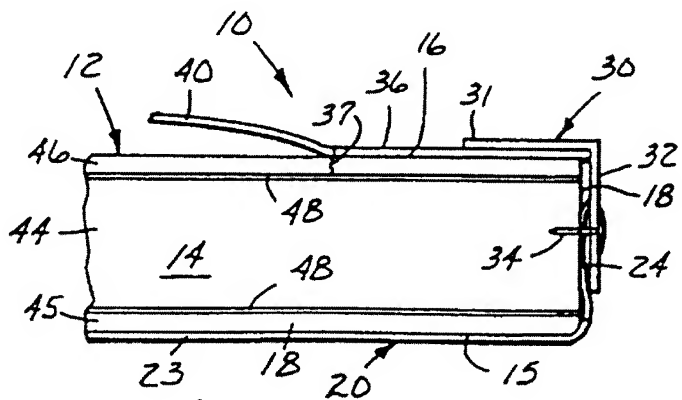


Figure 2

Figure 3



ABRADING ASSEMBLY

The present invention relates to abrading assemblies comprising back up pads for supporting abrasive sheet materials, particularly including those assemblies  
5 intended to be used manually to abrade surfaces with the abrasive sheets.

There are many known abrading assemblies comprising back up pads that employ many different attachment structures to attach an abrasive sheet along a support  
10 surface without the use of pressure sensitive adhesive e.g. US-A-734,954, 1,559,906, 1,710,308, 1,782,577, 2,256,098, 2,493,852, 2,724,936 and 4,202,139.

US-A-5,222,331 discloses a back up pad that is suitable for use to press abrasive coated screen cloth  
15 against urethane based primer on curved surfaces such as are commonly found on automobiles, and provides means for attaching abrasive sheets to the back up pad that requires a very small portion of the abrasive be engaged to limit waste of the abrasive. The abrading assembly  
20 comprises a back up pad comprising a self-supporting, resiliently flexible circular support layer e.g. a laminate comprising a central layer of a soft resiliently flexible polymeric foam, and outer resiliently flexible skin layers, and a flexible abrasive sheet. The abrasive  
25 sheet includes a circular central portion having a size generally corresponding to a front surface of the support layer, and at least two tab portions projecting from its central portion. The central portion of the sheet is adapted to overlie the front surface of the support layer  
30 with the tab portions positioned along its peripheral surface, and means are provided for releasably attaching each of the tab portions to the back up pad.

While providing two tab portions on opposite sides of the circular central portion of the abrasive sheet is preferred, alternatively more tab portions e.g. three or  
35 four could be around the periphery of its central portion. The use of two or four tab portions provides

the advantage that the tab portions can be cut from what otherwise would be salvage when circular abrasive sheets are cut edge to edge from a large supply roll of abrasive material. The tab portions are preferably rectangular projections from the circular central portion of the abrasive sheets, however other shapes such as truncated pyramidal shapes are also usable. The areas of the tab portions should be kept to a minimum to avoid edge cuts on a surface being abraded due to the bend in the abrasive sheet between the central portion and the tab portions of the abrasive sheet. The tab portions should represent less than 10% of the area of the abrasive sheet, and preferably should represent less than 5% of its area.

One of the problems associated with the above arrangement is that the abrasive sheet comprising the circular portion and tabs is generally cut from a web of abrasive material which results in remnant or weed waste abrasive material which requires disposal.

According to the present invention there is provided an abrading assembly comprising a self-supporting, resiliently flexible support layer in the shape of a polygon having  $n$  sides and  $n$  vertices where  $n$  is an integer which is 3 or greater than 4, said support layer having a front surface and a rear surface, and  $n$  peripheral edge surfaces between said front and rear surfaces;

a flexible abrasive sheet in contact with the front surface of the support layer, said sheet being square or rectangular in shape and having dimensions such that the vertices of the support layer lie on the perimeter of the sheet, and at least two of the corners of said sheet being folded such that the folded corner portions of the sheet are in contact with at least two of the peripheral edge surfaces of the support layer; and

means for securing the folded corner portions to the support layer.

The invention provides a simple, effective back up pad for supporting abrasive sheet materials which allows rectangular or square abrasive sheets to be used and secured to the back up pad by folding at least two  
5 corners of the abrasive sheet along the side of the back up pad and retaining the folded corners to peripheral edge surfaces of the back up pad. The folded corners may be releasably retained by any suitable means e.g. an elasticated strap extending around the periphery of the  
10 back up pad, the use of thumb tacks projecting through the folded corner of the abrasive sheet into peripheral edge surfaces of the back up pad etc.

The abrading assembly of the invention reduces weed waste since a web of abrasive material may simply be cut  
15 into rectangular shapes. The back up pad may have many different shapes e.g. triangular, pentagonal, hexagonal, octagonal etc. and may be a regular or irregular polygon.

The back up pad is particularly suitable for use with the abrasive sheet material noted above comprising  
20 porous screen cloth coated with abrasive and sold by Minnesota Mining and Manufacturing Company under the trade name WETORDRY FABRICUT abrasive to abrade the urethane based primer on automobiles. The back up pad is also useful, however, with other abrasive sheet materials  
25 including sheets of the lofty non-woven abrasive coated material sold under the trade mark SCOTCHBRITE, lapping film, or conventional abrasive sheet material comprising abrasive coated on a non-porous flexible paper or cloth backing sheet.

30 The abrading assembly as illustrated herein is intended for manual use and may include means along a rear surface of the support layer e.g. a resiliently elastic hand strap having ends attached to the support layer along its rear surface adapted to be engaged by a  
35 user's hand to afford retaining the palm of the users hand along that rear surface while the user moves his hand to move the central portion of the abrasive sheet

over a surface to be abraded. It is also contemplated, however, that some form of drive mechanism, such as a robot arm and/or a conventional rotary, oscillating and/or reciprocating drive mechanism could be attached to the back surface of the support layer to drive it, such as through the use of a hook and loop fastener.

In one embodiment the means for releasably attaching each of the folded corners to the back up pad comprises a rigid attachment member including a first portion having a first inner surface adapted to project along the rear surface and a second portion having a second inner surface adapted to overlay the folded corner portion opposite the peripheral surface of the support layer, a pointed projection projecting from the second inner surface adapted to pierce the folded corner portion and the support layer, and a resiliently elastic attachment strap having a first end attached to the first portion of the attachment member and a second end attached to the support layer along the rear surface. The attachment strap has a length adapted to bias the projection along the second inner surface into engagement with the corner and the support layer, and is resiliently extensible to afford removal of the projection from the folded corner portion and the support layer to afford removal of the flexible abrasive sheet from the back up pad.

Alternatively, other means for releasably attaching each of the folded corner portions to the back up pad could be provided such as by providing hooks adapted to engage the corner instead of the attachment members at the ends of the elastic attachment straps, or by providing hook and loop fastener means with, for example, the hooks on the periphery of the support layer and the loops on the corner portions.

The invention will now be described with reference to the accompanying drawings in which:

Figures 1a to 1c represent plan views of back up pads in accordance with the invention,

Figure 2 represents a perspective view of an abrading assembly in accordance with the invention, and

Figure 3 represents an enlarged fragmentary side view of an abrading assembly according to the invention.

5        Figures 1a to 1c illustrate octagonal, (n=8) heptagonal (n=7) and hexagonal (n=6) back up pads (12) for use in the invention. The back up pads are shown positioned on an abrasive sheet (20) represented in dashed outline. The abrasive sheets (20) are rectangular  
10        and are dimensioned to cover the entire surface area of the back up pads (12). The corners (24) of the abrasive sheet extend beyond the perimeter of the back up pad (12) and are folded along the side of the back up pad to provide anchorage points for the abrasive sheet.

15        Figure 2 illustrates an abrading assembly comprising an octagonal back up pad as shown in Figure 1a. The corners (24) of the abrasive sheet (20) are folded along peripheral edge surfaces (18) of the back up pad (12). An elasticated band (25) extends around the peripheral  
20        edge surfaces (18) of the back up pad and the corners (24) of the abrasive sheet (20) are tucked under the elasticated band (25) thereby releasably securing the abrading sheet (20) to the back up pad (12). The back up  
25        pad (12) may be provided with a handle (not shown) or means to secure the abrading assembly to a sanding machine.

Figure 3 disclose an alternative arrangement for securing the corners (24) of the abrasive sheet (20).

Referring to Figure 3, the abrading assembly (10)  
30        comprises a back up pad (12) comprising a self-supporting, resiliently flexible support layer (14) having front and rear surfaces (15, 16) and a peripheral edge surface (18) between its front and rear surfaces (15, 16). The assembly also includes a flexible abrasive  
35        sheet (20) having abrasive material secured thereto. The abrasive sheet (20) includes a central portion (23) having a size generally corresponding to the front

surface (15) of the support layer (14), and at least two corner portions (24) folded from its central portion (23). The central portion (23) of the abrasive sheet (20) is adapted to overlies the front surface (15) of the support layer (14) and the corner portions (24) are adapted to be positioned along the peripheral edge surface (18) of the support layer (14).

Means are provided for releasably attaching each of the corner portions (24) to the back up pad (12) including a rigid attachment member (30) including a first portion (31) having an inner surface adapted to project along the rear surface (16) of the support layer (14), and a second portion (32) having an inner surface adapted to overlay the side of the corner portion (24) opposite the peripheral surface (18) of the support layer (14). A pointed projection (34) i.e. the pointed projection from a thumb tack pressed through the second portion (32) projects from the second inner surface and is adapted to pierce the folded corner portion (24) and the support layer (14). A resiliently elastic attachment strap (36) has a first end attached to the first portion (31) of each of the attachment members (30), and a second end attached as by sewing stitches (37) to the support layer (14) along its rear surface (16). Each attachment strap (36) is attached in a position so that it extends across the support layer (14) and has a length adapted to bias the projection (34) on the second portion (32) into engagement with the corner portion (24) and the support layer (14), and is resiliently stretchable to afford removal of the projection (34) from the corner portion (24) and the support layer (14) to afford removal of the flexible abrasive sheet (20) from the back up (12).

The abrading assembly (10) further comprises a resiliently elastic hand strap (40) having been attached as by the sewing stitches (37) to the support (14) along its rear surface (16) and extending across the support layer (14) between the attachment straps (36). The strap



(40) provides means along the rear surface (16) of the support layer (14) adapted to be engaged by a user's hand e.g. by inserting a user's hand between the strap and rear surface (16) to afford retaining the palm of the user's hand along the rear surface (16) while the user moves his hand to move the central portion (23) of the abrasive sheet (20) over a surface to be abraded. The hand strap (40) and attachment straps (36) as illustrated may be provided by different portions of a single length of elastic strapping material, or could alternatively be provided by discrete lengths of strapping material.

The support layer (14) is a laminate comprising a central layer (44) of resiliently flexible polymeric foam, and resiliently flexible outer layers (45, 46) defining the front and rear surfaces (15, 16) respectively, which outer layers (45, 46) are also of a strong polymeric foam and are adhered to the central layer by stretchy layers (48) of adhesive.

In one embodiment, the central layer (44) can be a 0.79cm (0.3") thick layer of a skinless soft closed cell neoprene foam having a density of 12 to 20 pounds per cubic foot, a durometer from 40 to 60 on the Shore 00 scale, a tensile strength of 85 pounds per square inch, and an elongation of 200%; the outer layer (45) can be a 0.32cm (0.125") thick layer of a strong stretchy closed cell neoprene foam having a density of 15 to 30 pounds per cubic foot, a durometer of from 35 to 60 on the Shore 00 scale, a tensile strength of 100 pounds per square inch, and an elongation of 200% and which has no skin so that the front surface (15) is porous and thus makes good frictional engagement with the abrasive sheet (20) to drive it with the support layer (14) along a surface to be abraded while not being abraded by the abrasive sheet (20); and the outer layer (46) can be a 0.32cm (0.125") thick strong stretchy layer of a closed cell neoprene foam having a density of 10 to 16 pounds per cubic foot, a durometer of from 25 to 45 on the Shore 00 scale, a

tensile strength of 50 pounds per square inch, and a elongation of 150% and which has a skin defining the rear surface (16) for comfortable no slip engagement by a user's hand. Alternatively, the central layer (44) can  
5 be 1.9cm or 0.75" thick layer of a four pound open cell polyester foam used with the same outer layers (45, 46) described above to provide a softer back up pad that may be preferred by some users for some uses.

CLAIMS

1. An abrading assembly comprising a self-supporting, resiliently flexible support layer in the shape of a polygon having  $n$  sides and  $n$  vertices where  $n$  is an integer which is 3 or greater than 4, said support layer  
5 having a front surface and a rear surface, and  $n$  peripheral edge surfaces between said front and rear surfaces;

a flexible abrasive sheet in contact with the front  
10 surface of the support layer, said sheet being square or rectangular in shape and having dimensions such that the vertices of the support layer lie on the perimeter of the sheet, and at least two of the corners of said sheet being folded such that the folded corner portions of the  
15 sheet are in contact with at least two of the peripheral edge surfaces of the support layer; and

means for securing the folded corner portions to the support layer.

2. An abrading assembly as claimed in Claim 1 in which  
20 the support is in the form of a hexagon or octagon and four corners of the abrasive sheet are folded along the peripheral surface of the support layer.

3. An abrading assembly as claimed in Claim 1 or Claim 2 in which the means for releasably securing the folded  
25 corners to the support layer comprise an elastically band extending around the peripheral surface of the support layer.

4. An abrading assembly as claimed in Claim 1 or Claim 2 in which the means for releasably securing the folded  
30 corners to the support layer comprises thumb tacks.

5. An abrading assembly as claimed in any preceding Claim in which the flexible support additionally comprises a handle or strap for engagement by a user's hand.

6. An abrading assembly as claimed in Claim 1  
35 substantially as herein described with reference to the accompanying drawings.

<b>Patents Act 1977</b> <b>Examiner's report to the Comptroller under Section 17</b> <b>(I Search report)</b>	Application number GB 9505913.5
<b>Relevant Technical Fields</b>  (i) UK Cl (Ed.N)      B3D (DEP, DER) (ii) Int Cl (Ed.6)      B24D 15/00, 02, 04; 3/00  <b>Databases</b> (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications.  (ii) ONLINE: WPI	Search Examiner M J INSLEY
	Date of completion of Search 22 MAY 1995
	Documents considered relevant following a search in respect of Claims :- 1-6

**Categories of documents**

<b>X:</b> Document indicating lack of novelty or of inventive step.	<b>P:</b> Document published on or after the declared priority date but before the filing date of the present application.
<b>Y:</b> Document indicating lack of inventive step if combined with one or more other documents of the same category.	<b>E:</b> Patent document published on or after, but with priority date earlier than, the filing date of the present application.
<b>A:</b> Document indicating technological background and/or state of the art.	<b>&amp;:</b> Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2074062 A (TRENCHBOND) see whole document, particularly page 1 lines 78-81	
A	EP 0452593 A (MMM) equivalent to US 5222331 referred to in application	
A	US 5313746 A (ZARRIELLO) see Figure 4	

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